Measurements of Thermophysical Properties of Solids by Means of a Laser Diagnostic Technique

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Two non-contact methods of measurement of the thermal diffusivity of solids based on the determination of the parameters of the temperature field by laser diagnostic techniques were developed.

In the first method, the parameters of temperature oscillations in various points of a specimen were determined through oscillations of polarization plane of laser scanning radiation. This method permits measurements on specimens with a size less than $0.01~\text{mm}^2$ over a wide range of temperatures with an error of 5-8%. Thermal diffusivity of superconducting ceramics $YBa_2Cu_3O_{7x}$ and of Fe, Ni, W, Mo and also transition contact zones of bimetallic structures was measured by this method over the temperature range from 90-300 K. Bimetallic structures were obtained by an explosion technique. Ti, Nb, Mo, W, Fe, Ni were used as contact pairs. The performed investigations showed that thermal diffusivity of contact zones in all cases is sufficiently less than that of metals in contact pairs.

The second method of measurement of thermal diffusivity is based on the classical Parker's method. Laser determination of the parameters of a heat pulse passed through a specimen was used. Thermal diffusivity of some transition metals and Fe-Co alloys over the temperature range 77-300 K was measured by this method.